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TREASURY DEPARTMENT

METHODS of ARTIFICIAL RESPIRATION

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Methods of Artificial Respiration

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INTRODUCTION

This publication cancels and supersedes the pamphlet "Methods of Artificial Respiration" (CG–139) dated 17 June 1948 and all previous editions thereof.

The two manual methods of artificial respiration approved for Coast Guard use are the Schaefer Prone Pressure Method and the Eve Method, either of which may be used in conjunction with the application of oxygen.

All Coast Guard personnel shall be trained and become proficient in the methods of artificial respiration in accordance with the procedures and rules set forth in this publication.

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METHODS OF ARTIFICIAL RESPIRATION

ASPHYXIA

Asphyxia is a condition in which breathing has stopped. It may be the result of either abnormal physiological or physical causes.

The physiological causes of asphyxia may include lack of stimulation of the respiratory center in the brain, paralysis of the respiratory center, and the inability of the blood to absorb oxygen from the lungs or to effect the normal exchange of gases in the body tissues.

When it is due to physical causes, it may be spoken of as suffocation. In asphyxia resulting from physical causes the lungs are deprived of air because of stoppage of the air passages mechanically. Such causes may include water in the air passages, as in drowning; foreign body in the air passages; tumor in the air passages; swelling of the mucous membrane in the nose and throat following inhalation of live steam or an irritating gas; constriction around the neck compressing the windpipe; and the lack of oxygen from any cause. The most frequent causes of stopping of breathing are drowning, electrical shock, and gas poisoning. Asphyxia may be present also in victims of shock or collapse, of extreme exposure to heat or cold, and chemical poisoning.

SYMPTOMS OF ASPHYXIA

The symptoms by which the necessity for artificial respiration may be recognized are: Cyanosis (blueness of the skin and membrane), suspension of respiration, or shallow breathing in some cases of poisoning.

TREATMENT OF ASPHYXIA

The first thing to do in treatment is to remove the cause of the asphyxia or to remove the patient from the cause. Then administer artificial respiration. Later treat as for shock. In some cases artificial respiration can be administered while the patient is being removed from the cause to more suitable surroundings. The treatment for shock can often be started while artificial respiration is being administered.

The patient's mouth should be cleared of any obstruction, such as chewing gum, tobacco, false teeth, or mucous, so that there is no interference with the entrance into and escape of air from the lungs.

Artificial respiration should be started immediately. Every moment of delay is serious. It should be continued for at least 4 hours without

interruption until normal breathing is established or until the patient is pronounced dead by a medical officer.

Not infrequently the patient, after a temporary recovery of respiration, stops breathing again. The patient must be watched and if natural breathing stops, artificial respiration should be resumed at once. Perform artificial respiration gently and at the proper rate. Roughness may injure the patient.

Every precaution must be taken to prevent further injury to the patient. It may be necessary to give artificial respiration over a prolonged period of time. In the methods that require the application of pressure, injury to the skin, ribs, and internal organs must be avoided.

SCHAEFER PRONE PRESSURE METHOD

The Schaefer prone pressure method can be carried on for a considerable length of time by one person and without danger to the patient if the operator does not exert undue pressure. Its principle is alternately compressing the chest and releasing the pressure, thus causing air to flow out of and into the lungs. Approximately 60 pounds pressure is probably sufficient even for a large adult. Even though a different method of artificial respiration is to be used later, the Schaefer method should be used until conditions are such as to permit institution of the better method.

1. Lay the patient on his abdomen, one arm extended directly overhead, the other arm bent at the elbow and with the face turned sideways and resting on the hand or forearm, so that the nose and mouth are free for breathing. (See fig. 1—first position.)

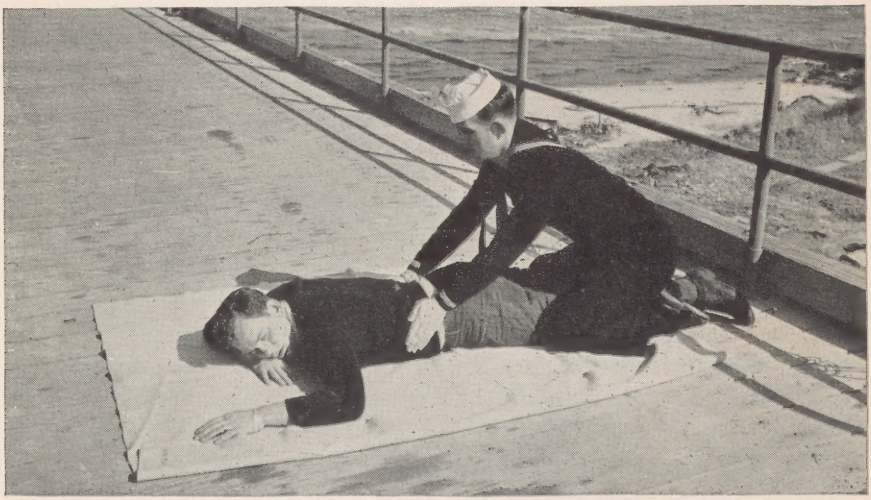

FIG. 1

2. Kneel, straddling the patient's thigh on the side toward which the face is turned, with your knees placed at such a distance from the hip bones as to permit the position shown in the figure. (See fig. 1.)

Place the palms of the hands on the small of the back with the fingers resting on the ribs, the little finger just touching the lowest rib, with the thumb and fingers in a natural position and the tips of the fingers just out of sight. (See fig. 1.)

3. With the arms held straight, swing forward slowly, so that the weight of the body is gradually brought to bear upon the patient. The shoulder should be directly over the heel of the hand at the end of the forward swing. (See fig. 2—second position.) Do not bend the elbows. This operation should take about 2 seconds.

FIG. 2

4. Now immediately swing backward so as to remove the pressure completely. (See fig. 3—third position.)

5. After 2 seconds swing forward again. Repeat unhurriedly 12 to 15 times a minute the double movement of compression and release, a complete respiration in 4 or 5 seconds.

6. As soon as artificial respiration has been started and while it is being continued, an assistant should loosen any tight clothing about the patient's neck, chest, or waist. The patient should be kept warm.

7. When natural breathing has been restored, the patient should be treated as for shock.

8. In carrying out resuscitation it may be necessary to change the operator. This shift can easily be accomplished while counting the rhythm aloud.

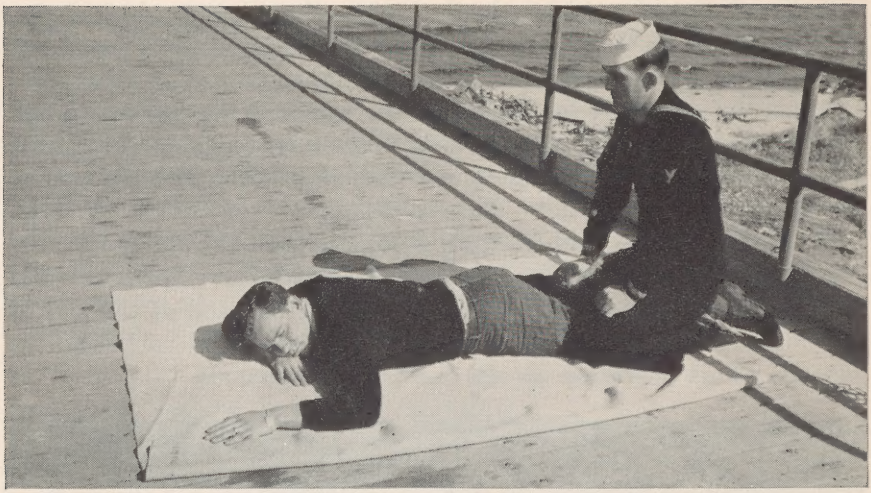

FIG. 3

EVE METHOD

Figures 4–8 illustrate the shift from Schaefer to Eve, and the principal positions of the Eve Method. These illustrations also indicate how the inhalator is used for both the Schaefer and Eve Methods.

The Eve Method makes use of the weight of the abdominal organs alternately to push and pull the diaphragm up and down in the manner of a piston and consists of rocking the patient, securely lashed to the litter or board, over a fulcrum. This method is easy on the patient, is less tiring to the operator, and requires less skill than other methods.

Its disadvantage is that it requires some apparatus, namely a litter, or board, and a fulcrum. The apparatus illustrated is specially designed for the purpose; however, apparatus may be improvised which will accomplish the same effect. In any case, regardless of the type of apparatus available, the shift from Schaefer to Eve should not be made until it is certain the apparatus is in all respects ready for proper operation.

Procedure:

1. The patient is laid face down on a litter or board, with arms outstretched or at the sides, whichever is more convenient. (See fig. 4.)

2. The application of the Schaefer method is resumed as quickly as possible with the least interruption of rhythm. (See fig. 4.)

3. The ankles and wrists are secured to the litter or board. (See fig. 4.)

4. If an inhalator is available, it is applied in accordance with the rules and instructions on page 7 and in the directions furnished with the equipment. (See fig. 5.)

FIG. 4

FIG. 5

FIG. 6

FIG. 7

5. The fulcrum is set up near the litter and within reach of the inhalator hose. (See fig. 5.)

6. The litter, or board, is placed on the fulcrum. (See fig. 6.)

7. In resuscitating an apparently drowned person, the first head-down tilt should be maintained until no more water drains from the stomach or lungs. (See fig. 7.)

8. The litter, or board, is rocked at 10 complete rocks a minute ("feet down 10 times a minute") with a tilt each way of 45° to 50°. (See figs. 7 and 8.)

FIG. 8

9. Continue until normal breathing is restored or until the patient is pronounced dead by a medical officer.

10. The patient should be kept warm.

11. When artificial respiration has been started, the treatment for shock should be instituted.

THE INHALATOR

The inhalator provides a supply of oxygen and carbon dioxide from which the lungs fill when manual artificial respiration is performed.

Since lack of oxygen is the basis for asphyxia from any cause, be it submersion, carbon monoxide, strangulation, electric shock, etc., the use of oxygen in resuscitation is highly desirable. A small percentage of carbon dioxide is added to prevent the loss of this respiratory stimulant during prolonged artificial respiration.

Inhalator apparatus consists of a tank of oxygen-carbon dioxide mixture, pressure reduction system, flow meter and rubber hose leading to a nasal tube. The mixture contains 95 percent oxygen and 5 percent carbon dioxide by volume. It is applied as follows:

(1) Manual artificial respiration is continued without interruption.

(2) The throat and mouth of the patient are freed of fluid, vomitus, etc., by careful wiping to insure a free airway. This should be repeated occasionally thereafter.

(3) With the oxygen-carbon dioxide tank open, a flow of two liters per minute registered on the flowmeter is permitted to pass through the system and out of the nasal tube. The nasal tube is then passed through the nostril to a distance equal to 1 inch less than the distance between the nostril and the ear canal. It is held in position by being passed backward over the head and secured at the forehead by adhesive tape.

(4) The head of the patient is tilted somewhat back toward the shoulder blades, straightening the air passages and preventing the tongue from falling backward and blocking the windpipe. The flow of oxygen-carbon dioxide mixture is gently raised to 4 liters per minute which is continued thereafter.

(5) Actual regulation of the inhalator mechanism will depend on the type and make used. The directions with the equipment should be followed. The above are general principles pertaining to inhalation from apparatus of any kind.

(6) Inhalation of oxygen may be rendered entirely safe if precautions are taken against explosion. There should be no oil whatever on or near fittings, and no lighted matches, pipes, cigarettes, etc., allowed in the vicinity of the resuscitation.

GENERAL RULES AND INFORMATION

1. Coast Guard procedure for artificial respiration is now officially based on the Schaefer and Eve Methods combined with oxygen by inhalation. The Howard-Sylvester Method is no longer approved as a Coast Guard method. The general rules outlined below are set forth as a guide to determine the proper course of action under various con-

ditions and to establish effective coordination with appropriate local organizations.

2. Inhalation is accomplished by means of "inhalator" apparatus which provides a means of supplying oxygen, or a mixture of oxygen and carbon dioxide, while inspiration and expiration is being induced by manual (Schaefer or Eve) artificial respiration. Many Coast Guard units are now equipped with inhalators and additional units will be furnished the equipment as it becomes available. Whenever a Coast Guard unit is not provided with an inhalator, advantage should be taken of oxygen brought to the scence of a resuscitation operation by civilian or other rescue teams.

3. The mechanical resuscitator (sometimes referred to as the "pulmotor"), which is not furnished to Coast Guard units, is an apparatus which supplies oxygen, or a mixture of oxygen and carbon dioxide, while inspiration and expiration is being induced by the application of alternating pressure. Although this equipment has its place when manned by skilled hands, it is possible that it may operate as a hazard rather than a help if it is handled unskillfully. Most resuscitators can be set up to operate as simple inhalators. Risks connected with the use of the pressure feature of the resuscitator can thus usually be avoided simply by using the resuscitator as an inhalator, in accordance with paragraph 4 (b) hereof.

4. *Comparison of Methods and Rules for Their Use:*

(*a*) The Schaefer method requires no equipment and is the quickest to put into operation. It should therefore be started immediately upon removing a victim of submersion from the water. Oxygen by inhalator should be administered as soon as possible. Although the exchange of air or oxygen is much less with the Schaefer method than with the Eve method, it may revive the patient before another method can be applied; otherwise, it serves to expel the water from the stomach and lungs and to keep the patient alive until a more effective method can be applied.

(*b*) The Eve method, which is easier on the patient and affords a greater exchange of oxygen in the lungs, thus greatly enhancing the chances of survival, should be substituted for the Schaefer method as quickly as possible and with the least possible interruption of rhythm. *The safest and probably the most effective general purpose method of resuscitation is the Eve method used in conjunction with the inhalator (or the mechanical resuscitator used as an inhalator), and accordingly shall take precedence over other methods including the mechanical resuscitator.*

(*c*) There is no substitute for thorough training, advance planning, and good judgment. A specific rule for each case cannot be made. Decisions as to whether a patient should be turned over to another team arriving on the scene, or as to the best choice of method under a

given set of circumstances, must be made by the person in charge. As a general guide to aid Coast Guard personnel in determining the proper course of action to follow, the various methods are listed below in the order of their relative merit:

(1) Eve method with oxygen;
(2) Mechanical resuscitator when manned by a competent team;
(3) Schaefer method with oxygen;
(4) Eve method without oxygen;
(5) Schaefer method without oxygen.

(*d*) In any case when a Coast Guard team using a manual method gives way to a resuscitator team the person in charge of the resuscitator team becomes responsible for the patient. However, Coast Guard personnel shall continue to render every assistance they are able to furnish for bringing the resuscitation to a successful conclusion.

5. Commanding officers and officers-in-charge shall ascertain whether resuscitation equipment is available in the vicinity of their units and shall endeavor to arrange for joint instruction of personnel of their units and of local rescue squads in order that efficient and coordinated action may be taken in resuscitation cases.

SHOCK

Shock is a term used to describe a condition in which the activities of the body are greatly depressed. The usual characteristics are "ashen" face, weak and rapid pulse, great lowering of blood pressure, listlessness, dulling of sensibility, subnormal temperature, and irregular gasping breathing. There may be cold sweat present. Some degree of shock follows most injuries. It may be slight and last only a few seconds, or it may be serious and even fatal. It may come on immediately, or be delayed, coming on several hours later. It may be due to profuse bleeding, exposure to cold, or poisons taken internally. It is almost always found in individuals who have had an interruption of breathing, whatever the cause.

If the patient is not in a condition of shock, he should receive treatment to prevent the development of shock. The same measures are used to prevent shock as to treat it.

TREATMENT OF SHOCK

When the patient revives, he should be kept under close observation for 48 hours even though he apparently feels all right. He should not be permitted to exert himself in any way.

The fundamental factors in the prevention and treatment of shock are heat, position, and stimulants.

A. Heat.

1. Preserve body heat.
   - *a.* Protect from exposure to cold.
   - *b.* Remove wet clothing and dry the patient.
   - *c.* Wrap the patient in blankets.
2. Application of external heat.
   - *a.* Care should be used to avoid burning the patient.
     1. Test the object used for applying heat by holding against the cheek or elbow for half a minute.
     2. Wrap in a layer of cloth or paper.
   - *b.* Methods:
     1. Hot water bottles.
     2. Chemical heating pads.
     3. Glass jars and bottles containing hot water.
     4. Hot bricks.
     5. Electrical heating pads.
   - *c.* To various regions.
     1. To the feet.
     2. Between the thighs.
     3. Along the sides of the body.
     4. Over the abdomen if not uncomfortable to the patient.

B. Position.

1. Place the body in such a position so that gravity will help the blood flow to the brain and heart.
   - *a.* Lay the patient on his back with the head low.
     1. This can be accomplished by raising the foot of the bed, cot, bench, or litter at least 18 inches higher than the head.
     2. If on a flat surface and other means are not available, elevate the feet, legs, and thighs.

C. Stimulants.

Do not attempt to make an unconscious person drink. Give in small quantities at a time.

1. Aromatic spirits of ammonia—a teaspoonful in half a glass of water is one of the most satisfactory stimulants. This can be repeated every 30 minutes as needed.
2. Coffee and tea both contain the drug caffeine, which is an excellent stimulant. Give the coffee or tea as hot as can be comfortably taken. A cupful may be given every 30 minutes as needed.
3. Hot milk, or even hot water, has some stimulating effect, due to the heat.

4. An inhalation stimulant, such as an ammonia ampule or aromatic spirits of ammonia on a handkerchief, may be placed near the patient's nose in cases in which the patient is not conscious. The one administering the stimulant should always test it on himself first.

5. Whiskey should not usually be given.

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